DECLARATION

I, Mayumi Takano, of Yanagida & Associates, 7F Shin-Yokohama KS Bldg., 3-18-3 Shin-Yokohama, Kohoku-ku, Yokohama-shi, Japan, hereby certify that I understand both English and Japanese, that the translation is true and correct, and that all statements are being made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Mayumi Takano

Mayumi Takano

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[Name of Document] SPECIFICATION

[Title of Invention] Holder for magnetic transfer device

[Scope of Demand for Patent]

1. A holder for a magnetic transfer device, comprising: a first holder portion and a second holder portion which are movable toward and away from each other and between which there is formed an interior space where first and second master carriers with information are held in intimate contact with both sides of a slave medium, to which the information borne by the master carrier is transferred;

wherein said first holder portion has a pressing surface on which said first master carrier and said slave medium are held, and said second holder portion has a pressing surface against which said second master carrier is pressed; and

wherein a compressive deformation quantity of the pressing surface of said first holder portion when pressure is applied is greater than that of the pressing surface of said second holder portion.

2. The holder for a magnetic transfer device as set forth in claim 1, wherein the pressing surfaces of said

first and second holder portions are both constructed of an elastic member.

3. The holder for a magnetic transfer device as set forth in claim 2, wherein the elastic member of the first holder portion has an elastic modulus smaller than that of the elastic member of the second holder portion.

4. The holder for a magnetic transfer device as set forth in claim 2, wherein the elastic member of the first holder portion has a thickness greater than that of the elastic member of the second holder portion.

5. The holder for a magnetic transfer device as set forth in claim 1, wherein the first pressing surface of said first holder portion is constructed of an elastic member and the second pressing surface of said second holder portion is constructed of a rigid body.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

The present invention relates to a holder for a magnetic transfer device that magnetically transfers information carried by a master carrier to a slave medium, and more particularly to such a holder for enclosing the

master carrier and the slave medium in its interior space and bringing the master carrier into intimate contact with the slave medium.

[0002]

[Description of the Related Art]

In magnetic transfer, which is the subject of the present invention, a master carrier (patterned master) has at least a magnetic layer in which information such as servo signals is formed as a "land/groove" pattern or embedded structure, and is brought into intimate contact with a slave medium having a magnetic recording portion. By applying a transfer field, a magnetization pattern corresponding to the information borne by the master carrier is transferred and recorded on the magnetic recording portion of the slave medium.

[0003]

In the case where the above-described slave medium is in the form of a disk, such as a hard disk or high-density flexible disk, one or two master carriers in the form of a disk are brought into intimate contact with one side or both sides of the slave medium, and a transfer field is applied by a magnetic field application device, arranged on one side or both sides, which consists of

electromagnets or permanent magnets.

[0004]

To enhance transfer quality in the magnetic transfer, it is vital to contact the master carrier and the slave medium uniformly. If they are imperfectly contacted, an area will occur in which no magnetic transfer is performed. If no magnetic transfer is performed, a signal dropout error will occur in magnetic information transferred to the slave medium and signal quantity will be degraded. In the case where recorded signals are servo signals, the tracking function cannot be sufficiently obtained and therefore reliability will be degraded.

[0005]

In the above-described magnetic transfer, from the viewpoint of obtaining uniform contact over the entire surfaces thereof, it is preferable that the above-described master carrier and slave medium be held in intimate contact within an interior space of a holder that is formed by two movable holder portions.

[0006]

And with the master carrier and slave medium stacked within the holder at the time of magnetic transfer, external pressure is applied on the master carrier and

slave medium through the holder by mechanical drive means such as an air cylinder, a servo motor, etc. In this manner, the master carrier and slave medium are brought into intimate contact with each other. In this method of applying pressure mechanically, in order to obtain uniform pressure, elastic members of the same thickness and elastic modulus are arranged in both holder portions (e.g., see patent document 1).

[0007]

However, in the case where the above-described master carrier and slave medium are brought into intimate contact through the same elastic members arranged on both sides, the elastic members are required to have softness for bringing the master carrier and slave medium into intimate contact uniformly at uniform pressure, and hardness for performing magnetic transfer with the master carrier and slave medium contacted intimately to each other while maintaining flatness. These requirements are incompatible, and consequently, imperfect contact between the master carrier and the slave medium and positional shifts of transferred signals will result.

[0008]

From the above-described points, installing the

elastic member in the pressing surface of the other holder portion which presses against one holder portion holding the slave medium may be considered, whereby intimate contact is enhanced by pressing the slave medium through the elastic member.

[0009]

[Patent Document 1]

No. 7(1995)-78337

[0010]

[Problems to be solved by the Invention]

However, in the case where, with the above-described holder for a magnetic transfer device, double-sided simultaneous transfer is performed with both sides of the slave medium contacted intimately to master carriers, the master carriers are first held on the pressing surfaces of two movable holder portions respectively. Then, the slave medium is held on the master carrier held on one holder portion. Next, by moving the two holder portions toward each other, the master carriers and the slave medium are brought into intimate contact with one another, and magnetic transfer is continuously repeated. However, when the two holder portions are separated after magnetic transfer, there are cases where the slave medium, both

sides of which were brought into contact with the master carrier, is separated not attached to the holder portion to which the slave medium was supplied, but attached to the holder portion arranged on the opposite side. That is, there are cases where the slave medium cannot be removed easily after magnetic transfer.

[0011]

In the mechanism for removing the slave medium after magnetic transfer, the slave medium is removed on the assumption that the slave medium remains held after magnetic transfer by one holder portion to which the slave medium is supplied. However, after magnetic transfer, if the slave medium is held by the other holder portion, the removal mechanism cannot hold the slave medium and therefore a removal failure will occur.

[0012]

As a result of analyzing the above phenomenon, it was revealed that, conventionally, an elastic member for enhancing intimate contact between the master carrier and the slave medium is installed in the pressing surface of the other holder portion which operates pressing and does not hold the slave medium. Therefore, the other side of the master carrier pressed through the elastic member is

pressed so as to follow the surface form of the slave medium by the action of the elastic member, thereby greater contact than the master carrier of one holder portion is obtained, and as a result, the contact force to the slave medium is enhanced and the slave medium is peeled from one holder portion of the master carrier due to this contact force.

[0013]

Also, in the case that the same elastic members are installed in both sides of the pressing surface, the slave medium is moved to the other holder portion when the two holder portions are separated after magnetic transfer, therefore, stable separation cannot be obtained.

[0014]

Hence, it is an object of the present invention to provide a holder for a magnetic transfer device which is capable of preventing a removal failure by holding a slave medium after magnetic transfer by a holder portion arranged on a side to which the slave medium is supplied.

[0015]

[Means used to solve the Problems]

In accordance with the present invention, there is provided a holder for a magnetic transfer device. The

holder of the present invention comprises a first holder portion and a second holder portion, which are movable toward and away from each other. Between the first and second holder portions, there is formed an interior space where first and second master carriers with information are held in intimate contact with both sides of a slave medium, to which the information borne by the master carrier is transferred. The first holder portion has a pressing surface on which the first master carrier and the slave medium are held, and the second holder portion has a pressing surface against which the second master carrier is pressed. When pressure is applied, the compressive deformation quantity of the pressing surface of the first holder portion is greater than that of the pressing surface of the second holder portion.

[0016]

In the holder of the present invention, the pressing surfaces of the aforementioned first and second holder portions are preferably constructed of an elastic member. In this case, the aforementioned compressive deformation quantity is adjusted by making the elastic modulus of the elastic member of the first holder portion smaller than that of the elastic member of the second holder portion,

or making thickness of the elastic member of the first holder portion greater than that of the elastic member of the second holder portion, or by a combination of both.

[0017]

In the holder of the present invention, the first pressing surface of the first holder portion may be constructed of an elastic member, and the second pressing surface of the second holder portion may be constructed of a rigid body. Also, the above-described characteristics may be obtained by using different members in the first and second holder portions.

[0018]

When pressure is applied, the compressive deformation quantity of the pressing surface of the first holder portion is preferably 5 to 50 μm and the compressive deformation quantity of the pressing surface of the second holder portion is less than 5 μm.

[0019]

[Advantageous Effects of the Invention]

According to the holder of the present invention, when double-sided simultaneous transfer is performed with master carriers contacted intimately to both sides of a slave medium between a first holder portion and a second

holder portion which are movable toward and away from each other, the compressive deformation quantity of the pressing surface of the first holder portion which holds the master carrier and the slave medium together when pressure is applied is greater than that of the pressing surface of the second holder portion which holds the second master carrier. Therefore, the intimate-contact force between the master carrier and slave medium on the side of the first holder portion becomes higher than that between the master carrier and slave medium on the side of the second holder portion. When the first and second holder portions are separated after magnetic transfer, the slave medium is always held by the first holder portion. Therefore, the removal failure of the slave medium can be reliably prevented and the magnetic transfer process can be efficiently executed.

[0020]

In addition, the pressing surface (whose compressive deformation quantity is small) of the second holder portion serves as a reference surface, whereby the flatness between the master carriers and the slave medium is assured. The pressing surface (whose compressive deformation quantity is great) of the first holder portion

serves as a buffer member, whereby the master carriers and slave medium are caused to follow the above-described reference surface. And with the flatness between the master carriers and the slave medium maintained, the master carriers can be contacted intimately to both sides of the slave medium uniformly over the entire surfaces thereof, so high positional accuracy and high quality of recorded signals on the entire slave medium are both achieved.

[0021]

[Description of the Preferred Embodiment]

Embodiments of the present invention will be described in detail below with reference to the attached drawings. Referring to Fig. 1, there is a schematic sectional view showing the open state of a holder for a magnetic transfer device constructed in accordance with a first embodiment of the present invention. Referring to Fig. 2, there is a schematic sectional view showing the open state of a holder for a magnetic transfer device constructed in accordance with a second embodiment of the present invention. Each figure is a view showing a frame format and, for facilitating the understanding of the present invention, the dimensions of each part are shown

at ratios differing from those of the actual dimensions.

[0022]

In the holder 1 illustrated in Fig. 1, magnetic transfer is simultaneously performed on both sides of a slave medium. The holder 1 is equipped with a left-side holder portion 5 and a right-side holder portion 6, which are movable toward and away from each other. Within an interior space A that is hermetically sealed by a seal cover 7 at the outer periphery when the left-side and right-side holder portions 5, 6 are moved toward each other, a slave medium 2 and opposite master carriers 3, 4 are arranged, and with the centers aligned with one another, the slave medium 2 and carriers 3, 4 are held in intimate contact with one another. The expression "intimate contact" is intended to mean that they are in direct contact with one another, or that they are in close proximity to one another with an extremely slight gap.

[0023]

The left-side holder portion 5 and right-side holder portion 6 are equipped with support shafts 5a, 6a extending from the center portions of the back surfaces, respectively. The support shafts 5a, 6a are rotatably supported by a left-side fixing portion 8 and right-side

fixing portion 9, respectively. The left-side fixing portion 8 has two bearings 8a and three seal members (O-rings) 8b provided with some space. Similarly, the right-side fixing portion 9 has two bearings 9a and three seal members (O-rings) 9b provided with some space.

[0024]

The left-side holder portion 5 has a pressing surface 5b, which holds and presses the left-side master carrier 3 and slave medium 2. The pressing surface 5b is constructed of a first elastic member 10. The right-side holder portion 6 has a pressing surface 6b, which holds and presses the right-side master carrier 4. The pressing surface 6b is constructed of a second elastic member 20.

[0025]

The first elastic member 10 and second elastic member 20 are formed so that when pressure is applied as described later, the compressive deformation quantity of the pressing surface 5b of the left-side holder portion 5 becomes greater than that of the pressing surface 6b of the right-side holder portion 6. For example, respective materials are selected so that the elastic modulus of the first elastic member 10 becomes smaller than that of the second elastic member 20, or the thickness of the first

elastic member 10 is made greater than that of the second elastic member 20. Also, materials and thickness may be adjusted so that the above-described relation between the compressive deformation quantities is obtained.

[0026]

Materials, thickness, etc., are determined so that when pressure is applied, the compressive deformation quantity of the pressing surface 5b (i.e., the first elastic member 10) of the left-side holder portion 5 is 5 to 50 μm and the compressive deformation quantity of the pressing surface 6b (i.e., the second elastic member 20) of the right-side holder portion 6 is less than 5μm.

[0027]

The left-side holder portion 5 is equipped with a first vacuum system 11 for suction holding the left-side master carrier 3 that transfers information such as servo signals to one side of the slave medium 2, and a second vacuum system 12 for suction holding the inner circumferential portion of the slave medium 2. The right-side holder portion 6 is equipped with a third vacuum system 13 for suction holding the right-side master carrier 4 that transfers information such as servo signals to the other side of the slave medium 2, and a fourth

vacuum system 14 for decompressing an interior space A.

[0028]

The vacuum systems 11 to 14 are connected from the holder portions 5 and 6, through the support shafts 5a and 5b, and to external units. That is, the left-side holder portion 5 is in the form of a disk and has the above-described first elastic member 10 on the interior surface corresponding to the size of the master carrier 3. The pressing surface 5b of the first elastic member 10 and the left-side holder portion 5 are provided with the suction apertures 11a of the first vacuum system 11, which are in communication with a first air passageway 11b. The first air passageway 11b is installed axially into the outer peripheral portion of the support shaft 5a from the disk portion of the left-side holder portion 5, and also protrudes from the disk portion of the left-side holder portion 5 to a height corresponding to the pressing surface 5b in ring form. Also, the left-side holder portion 5 is provided with the suction aperture 12a of the second vacuum system 12 at the holder surface located outside the inside diameter of the master carrier 3. The suction aperture 12a is in communication with a second air passageway 12b, which is installed axially into the center

portion of the support shaft 5a from the disk portion of the left-side holder portion 5. The first air passageway 11b and second air passageway 12b are open at different positions on the outer periphery of the support shaft 5a, and the fixing portion 8 are provided with three seal members 8b so that the first air passageway 11b and second air passageway 12b are isolated from each other. The first air passageway 11b and second air passageway 12b are in communication with communication holes 11c and 12c, which are connected to external vacuum sources or pumps (not shown) through air pipes 11d, 12d. In this manner, the first and second vacuum systems 11, 12 are connected to external vacuum pumps. If the vacuum pumps are actuated, the left side of the master carrier 3 and the inner circumferential portion of the slave medium 2 are suction held by the first vacuum system 11 and second vacuum system 12.

[0029]

Note that the first elastic member 10 may be fixedly attached to the left-side holder portion 5 by an adhesive, etc. Also, by closing some of the suction apertures 11a of the first elastic member 10, the first elastic member 10 may be suction held by the first vacuum system 11.

[0030]

On the other hand, the right-side holder portion 6, as with the left-side holder portion 5, is in the form of a disk and has the above-described second elastic member 20 on the interior surface corresponding to the size of the master carrier 4. The pressing surface 6b of the second elastic member 20 and the right-side holder portion 6 are provided with the suction apertures 13a of the third vacuum system 13, which are in communication with a third air passageway 13b. The third air passageway 13b is installed axially into the outer peripheral portion of the support shaft 6a from the disk portion of the right-side holder 6. Also, the holder surface of the second holder portion 6 which is inside the inside diameter of the master carrier 4 has a recess, and the center of the recess is provided with the suction aperture 14a of the fourth vacuum system 14. The suction aperture 14a is in communication with a fourth air passageway 14b, which is installed axially into the center portion of the support shaft 6a from the disk portion of the right-side holder portion 6. The third air passageway 13b and fourth air passageway 14b are open at different positions on the outer periphery of the support shaft 6a, and the fixing

portion 9 are provided with three seal members 9b so that the third air passageway 13b and fourth air passageway 14b are isolated from each other. The third air passageway 13b and fourth air passageway 14b are in communication with communication holes 13c and 14c, which are connected to external vacuum sources or pumps (not shown) through air pipes 13d, 14d. In this manner, the third and fourth vacuum systems 13, 14 are connected to external vacuum pumps. If the vacuum pumps are driven, the right side of the master carrier 4 is suction held by the third vacuum system 13. Also, the interior space A is decompressed by the fourth vacuum system 14, whereby an intimate-contact force is obtained, and intimate contact is enhanced because air is pumped out of the intimate contact surface.

[0031]

The seal members 8b and 9b, which are installed in the fixing portions 8 and 9, may be O-rings, magnetic fluid seals, and a combination of O-rings and magnetic fluid seals, which are mounted on the inner peripheries of the fixing portions 8, 9 or outer peripheries of the support shafts 5a, 6a. Magnetic fluid seals can prevent dust particles from occurring in sealed portions, because no dust particle occur during sliding.

[0032]

The seal cover 7 installed on the outer periphery of the right-side holder portion 6 is in the form of a ring, and it is mounted on a flange 6c protruding from the outer peripheral surface of the right-side holder portion 6 and is movable in the axial direction (toward and away from the left-side holder portion 5) through an elastic member 7a by the amount that the elastic member 7a is deformed. The end surface of the seal cover 7 is equipped with an end-surface seal member 7b, which consists of an O-ring and is pressed against the interior surface 5b of the left-side holder portion 5 to seal an interior space A hermetically. Also, the inner peripheral surface of the seal cover 7 is equipped with a peripheral-surface seal member 7c, which consists of an O-ring and is pressed against the outer peripheral surface of the right-side holder portion 6 to seal the outer peripheral surface hermetically.

[0033]

The left-side holder portion 5 and right-side holder portion 6 are connected to a drive mechanism (not shown) so they can rotate integrally on the support shafts 5a, 6a at the time of magnetic transfer. Although not shown, the

magnetic transfer device is equipped with a magnetic field application device that applies a transfer field while rotating the holder 1.

[0034]

At least one of the holder portions 5, 6 is movably supported in the axial direction (i.e., the right-left direction in Fig. 1) so they can move toward and away from each other. For instance, if the holder portions 5, 6 are moved from the position shown in Fig. 1 to a position where they are held in intimate contact with each other, the end-surface seal member 7b of the seal cover 7 is pressed against the end surface of the outer circumferential portion of the left-side holder portion 5, and the interior space A is hermetically sealed. After it is hermetically sealed, the interior space A is decompressed by the fourth vacuum system 14. The right-side holder portion 6 is further moved toward the left-side holder portion 5, whereby the master carriers 3, 4 are brought into intimate contact with both sides of the slave medium 2 at a predetermined pressure.

[0035]

To apply the intimate-contact force, in addition to the fourth vacuum system 14, the magnetic transfer device

is further equipped with press means that applies pressure on both sides of the holder 1 mechanically. The press means may be equipped with a pressure cylinder, which has a press rod to apply a predetermined press load to the support shaft 5a or 6a of the holder 1.

[0036]

When pressure is applied, the slave medium 2 held by the left-side holder portion 5 is depressed by the compressive deformation of the first elastic member 10, but the suction aperture 12a of the second vacuum system 12 is provided at a height taking the depressed quantity of the slave medium 2 into consideration, in order to prevent the slave medium 2 from strongly striking the holder surface near the suction aperture 12a.

[0037]

The first elastic member 10 and second elastic member 20 are formed into a disk sheet from an elastic material. The elastic material can employ, for example, non-foaming polyurethane, nitrile butadiene rubber (NBR), hydrogenated nitrile butadiene rubber (HNBR), ethylene propylene rubber (EPM · EPDM), fluoro rubber, acrylic rubber, HITOREL 3046 (trade name), HITOREL 3548L (trade name), etc. These materials are selected in consideration

of workability (precise thickness, flatness, etc.), elastic modulus capable of obtaining the above-described deformation quantity when pressure is applied, excellent wear resistance and high maintainability, occurrence of dust particles, characteristic changes due to temperature, and so on. The first and second elastic members 10, 20 are formed into a desired shape by injection molding, water jet molding, cold molding, etc.

[0038]

On the other hand, the positioning of the master carriers 3, 4 and slave medium 2 with respect to the left-side holder portion 5 and right-side holder portion 6 is performed, for example, either by making fine adjustments of the master carriers 3,4 or slave medium 2 in the X and Y directions with positioning marks as reference by the use of position observation means such as a measuring microscope, a CCD camera, etc., or by installing positioning members on the holder portions 5, 6 and mounting the inside diameter of the master carriers 3, 4 or slave medium 2 on the positioning members.

[0039]

The slave medium 2 is constructed of a magnetic storage disk, such as a hard disk, a high-density flexible

disk, etc., which has one or two magnetic recording portions (magnetic layers) on one side or both sides. The magnetic recording portion is constructed of a coat-type magnetic recording layer or metal thin film type magnetic recording layer.

[0040]

The master carriers 3, 4 are formed into a disk. The substrates of the master carriers 3, 4 have a microscopic land/groove pattern coated with a magnetic substance, and these inner surfaces of the master carriers 3, 4 are information carrying surfaces, having a transfer pattern, which are brought into intimate contact with both sides of the slave medium 2. On the other hand, the outer surfaces of the master carriers 3, 4 are suction held by the holder portions 5, 6. Materials for the substrates of the master carriers 3, 4 are nickel (Ni), silicon (Si), quartz, glass, aluminum, alloys, ceramics, synthetic resin, etc. The above-described land/groove pattern is formed by a stamper generation method, etc. The formation of the magnetic layer on the land/groove pattern is performed by a vacuum film forming method (such as vacuum evaporation, sputtering, ion plating, etc.), a plating method, etc. In both cases of in-plane recording and perpendicular

recording, master carriers 3, 4 to be used are approximately the same.

[0041]

In the case of in-plane recording, a magnetic field application device (not shown), for applying a transfer field and an initializing field, as necessary, is constructed of ring-type head electromagnets, which have a coil wound on a core having a radial gap in the radial direction of the slave medium 2 and are arranged on both sides of the holder 1. The electromagnets arranged on both sides apply transfer fields in the same direction parallel to the data track direction, respectively. By rotating the holder 1, the transfer fields are applied to the entire surfaces of the slave medium 2 and the master carriers 3, 4. Instead of rotating the holder 1, the magnetic field application device may be rotated with respect to the holder 1. The magnetic field application device may be arranged only on one side. There may be provided one or two permanent magnet devices on one side or both sides. Also, a magnetic field application device in the case of perpendicular recording is constructed of electromagnets or permanent magnets, which are arranged on both sides of the holder 1 and differ in polarity. The

magnetic field application device generates a magnetic field in a direction perpendicular to the holder 1 and applies it to the slave medium 2 and the master carriers 3, 4. In the case where a magnetic field is applied to a portion of the holder 1, the magnetic transfer to the entire surface is performed by moving either the holder 1 or the magnetic field.

[0042]

Next, a description will be given of operation of the holder 1. In the holder 1 of the magnetic transfer device, magnetic transfer is performed on a plurality of slave media 2 through the same master carriers 3, 4. Initially, the left-side master carrier 3 is positioned with respect to the left-side holder portion 5, and is held on the holder portion 5 by the first vacuum system 11. Similarly, the right-side master carrier 4 is positioned with respect to the right-side holder portion 6, and is held on the holder portion 6 by the third vacuum system 13.

[0043]

With the left-side holder portion 5 and the right-side holder portion 6 spaced, the slave medium 2 previously initially magnetized in the planar direction or perpendicular direction is positioned so that the center

is aligned with that of the master carrier 3. After the slave medium 2 and master carrier 3 are suction held by the second vacuum system 12, the right-side holder portion 6 is moved toward the left-side holder portion 5.

[0044]

After the interior space A of the holder 1 is closed, the interior space A is decompressed by pumping air out of the space A with the fourth vacuum system 14, and the interior is reduced to a predetermined degree of vacuum. If the right-side holder portion 6 is further moved toward the left-side holder portion 5, the slave medium 2 is brought into contact with the master carrier 4. With pressure due to an external force (atmospheric pressure) proportional to the degree of vacuum, and the applied pressure, parallel intimate-contact forces are exerted uniformly on the slave medium 2 and master carriers 3, 4 toward the left-side holder portion 5 through the first and second elastic members 10 and 20, whereby they are brought into intimate contact with one another at a predetermined contact pressure.

[0045]

When pressure is applied, the pressing surface 6b (i.e., the second elastic member 20 whose compressive

deformation quantity is small) of the right-side holder portion 6 serves as a reference surface, whereby the flatness between the master carriers 3, 4 and the slave medium 2 is assured. The pressing surface 5b (i.e., the first elastic member 10 whose compressive deformation quantity is great) of the left-side holder portion 5 serves as a buffer member, whereby the master carriers 3, 4 and slave medium 2 are caused to follow the above-described reference surface. Therefore, with the flatness between the master carriers 3, 4 and the slave medium 2 maintained, the master carriers 3, 4 are contacted intimately to both sides of the slave medium 2 uniformly over the entire surfaces thereof.

[0046]

The intimate contact between the left-side master carrier 3 and slave medium 2 in the left-side holder portion 5 is greater than that between the right-side master carrier 4 and the other side of the slave medium 2 in the right-side holder portion 6, because great deformation of the first elastic member 10 allows the master carrier 3 to make contact with one side of the slave medium 2 more accurately.

[0047]

Thereafter, the magnetic field application device is moved to both sides of the holder 1, and applies transfer fields in a direction opposite to the direction of the initial magnetization while rotating the holder 1. With the applied transfer fields, magnetization patterns corresponding to the transfer patterns of the master carriers 3, 4 are transferred and recorded on the magnetic recording portions of the slave medium 2.

[0048]

Each of the transfer fields applied during magnetic transfer is passed through the land pattern portion of the land/groove pattern (transfer pattern) of each master carrier 3 or 4 that is constructed of magnetic substance and in intimate contact with the slave medium 2. In the case of in-plane recording, the initial magnetization in the land pattern portion of the land/groove pattern is not reversed, but the initial magnetization in the groove pattern portion is reversed. In the case of perpendicular recording, the initial magnetization in the land pattern portion is reversed, but the initial magnetization in the groove pattern portion is not reversed. As a result, magnetization patterns corresponding to the transfer patterns on the master carriers 3, 4 are transferred and

recorded on both sides of the slave medium 2.

[0049]

After magnetic transfer, the left-side and right-side holder portions 5 and 6 of the holder 1 are separated to remove the slave medium 2. That is, if the operation of the fourth vacuum system 14 is stopped to raise pressure, the right-side holder portion 6 is moved away from the left-side holder portion 5. As to the contact force of the both sides of the master carriers 3, 4 with the slave medium 2, the intimate contact between the left-side master carrier 3 of the left-side holder portion 5 and the slave medium 2 is greater than that between the right-side master carrier 4 of the right-side holder portion 6 and the slave medium 2, and therefore the suction force of the left-side master carrier 3 with respect to the slave medium 2 is greater than that of the right-side master carrier 4 with respect to the slave medium 2. Because of this, the right-side master carrier 4 held by the right-side holder portion 6 is separated from the slave medium 2, and the slave medium 2 remains held by the left-side holder portion 5 and the holder 1 performs the opening operation. Thereafter, the slave medium 2 after magnetic transfer is removed from the

left-side holder portion 5 by a removing mechanism (not shown). A new slave medium 2 is supplied and the above-described magnetic transfer is repeated.

[0050]

According to the first embodiment, when pressure is applied, the compressive deformation quantity of the first elastic member 10 installed in the left-side holder portion 5 that holds the slave medium 2 is made greater than that of the second elastic member 20 installed in the right-side holder portion 6. Therefore, when the holder 1 is opened to remove the slave medium 2, the slave medium 2 is reliably held by the left-side holder portion 5. The removal of the slave medium 2 is reliably performed, so a reduction in the rate of operation due to a removal failure can be prevented. In addition, because of better contact between the carriers 3, 4 and both sides of the slave medium 2, magnetic transfer of high quality is continuously performed and reliability is enhanced.

[0051]

FIG. 2 is a schematic sectional view showing the open state of a holder for a magnetic transfer device constructed in accordance with a second embodiment of the present invention. This embodiment is characterized in

that an elastic member is provided only in a left-side holder portion 5.

[0052]

The holder 100 of the second embodiment, as with the first embodiment, is equipped with a left-side holder portion 5 and a right-side holder portion 6 which are movable toward and away from each other. Within an interior space A that is hermetically sealed by a seal cover 7 at the outer periphery when the left-side and right-side holder portions 5, 6 are moved toward each other, a slave medium 2 and master carriers 3, 4 are held in intimate contact with one another, and in this state, magnetic transfer is performed.

[0053]

The basic structure of the left-side holder portion 5 and right-side holder portion 6 is the same as the first embodiment, so a description of the same parts is omitted by applying the same reference numerals to the same parts.

[0054]

The left-side holder portion 5 is equipped with a pressing surface 5b that holds and presses the left-side master cattier 3. The pressing surface 5b is constructed of an elastic member 30. The right-side holder portion 6

is equipped with a pressing surface 6b that holds and presses the right-side master cattier 4. The pressing surface 6b is constructed of the interior surface (holder surface) made by a rigid body of the right-side holder portion 6 and has no elastic member.

[0055]

With this arrangement, when pressure is applied, the compressive deformation quantity of the pressing surface 5b (elastic member 30) of the left-side holder portion 5 becomes greater than that of the pressing surface 6b (a rigid body) of the right-side holder portion 6. The material, thickness, etc., of the elastic member 30 are determined so that when pressure is applied, the compressive deformation quantity is 5 to 50 μm.

[0056]

Note that the suction holding of the master carrier 4 in the right-side holder 6 is performed through the suction apertures 13a of a third suction system 13 formed in the pressing surface 6b. Also, the interior space A is decompressed by the suction aperture 14a of a fourth vacuum system 14 formed in the center portion of the pressing surface 6b.

[0057]

The magnetic transfer process in the second embodiment is performed in the same manner as the first embodiment. With the master carriers 3 and 4 held by the holder portions 5 and 6, respectively, the slave medium 2 is supplied and the interior space A is closed. By decompressing the interior space A, uniform and parallel intimate-contact forces are applied through the elastic member 30, whereby the master carriers 3, 4 are brought into intimate contact with both sides of the slave medium 2 at a predetermined contact pressure.

[0058]

When pressure is applied, the pressing surface 6b (whose compressive deformation quantity is small) (a rigid body) of the right-side holder portion 6 serves as a reference surface, whereby the flatness between the master carriers 3, 4 and the slave medium 2 is assured. The pressing surface 5b (i.e., the elastic member 30 whose compressive deformation quantity is great) (elastic member 30) of the left-side holder portion 5 serves as a buffer member, whereby the master carriers 3, 4 and slave medium 2 are caused to follow the above-described reference surface. And with the flatness between the master carriers 3, 4 and the slave medium 2 maintained, the

master carriers 3, 4 are contacted intimately to both sides of the slave medium 2 uniformly over the entire surfaces thereof.

[0059]

Also, the intimate contact between the left-side master carrier 3 and slave medium 2 in the left-side holder portion 5 is greater than that between the right-side master carrier 4 and slave medium 2 in the right-side holder portion 6, because deformation of the elastic member 30 allows the master carrier 3 to make contact with one side of the slave medium 2 more accurately.

[0060]

And at the time of the opening operation after magnetic transfer, the right-side master carrier 4 held by the right-side holder portion 6 is separated from the slave medium 2, because the intimate contact (or suction force) between the left-side master carrier 3 and slave medium 2 in the left-side holder portion 5 is greater than that between the right-side master carrier 4 and slave medium 2 in the right-side holder portion 6. When this is occurring, the slave medium 2 remains held by the left-side holder portion 5 and the holder 1 is opened.

[0061]

According to the second embodiment, the pressing surface 5b of the left-side holder portion 5 that holds the slave medium 2 is provided with the elastic member 30, whereby the compressive deformation quantity of the pressing surface 5b of the left-side holder portion 5 when pressure is applied becomes greater than that of the pressing surface 6b of the right-side holder portion 6. Therefore, when the holder 1 is opened to remove the slave medium 2, the slave medium 2 is reliably held by the left-side holder portion 5, so a removal failure can be prevented. In addition, because of better contact between the carriers 3, 4 and the slave medium 2, magnetic transfer of high quality is continuously performed and reliability is enhanced.

[Brief Description of the Drawings]

FIG. 1 is a schematic sectional view showing the open state of a holder for a magnetic transfer device constructed in accordance with a first embodiment of the present invention;

FIG. 2 is a schematic sectional view showing the open state of a holder for a magnetic transfer device

constructed in accordance with a second embodiment of the present invention.

[Explanation of the Reference Numerals]

1, 100	holder
2	slave medium
3, 4	master carrier
5	left-side holder portion
5b	pressing surface
6	right-side holder portion
6b	pressing surface
10, 20, 30	elastic member
11 ～ 14	vacuum system
A	interior space

FIG.1

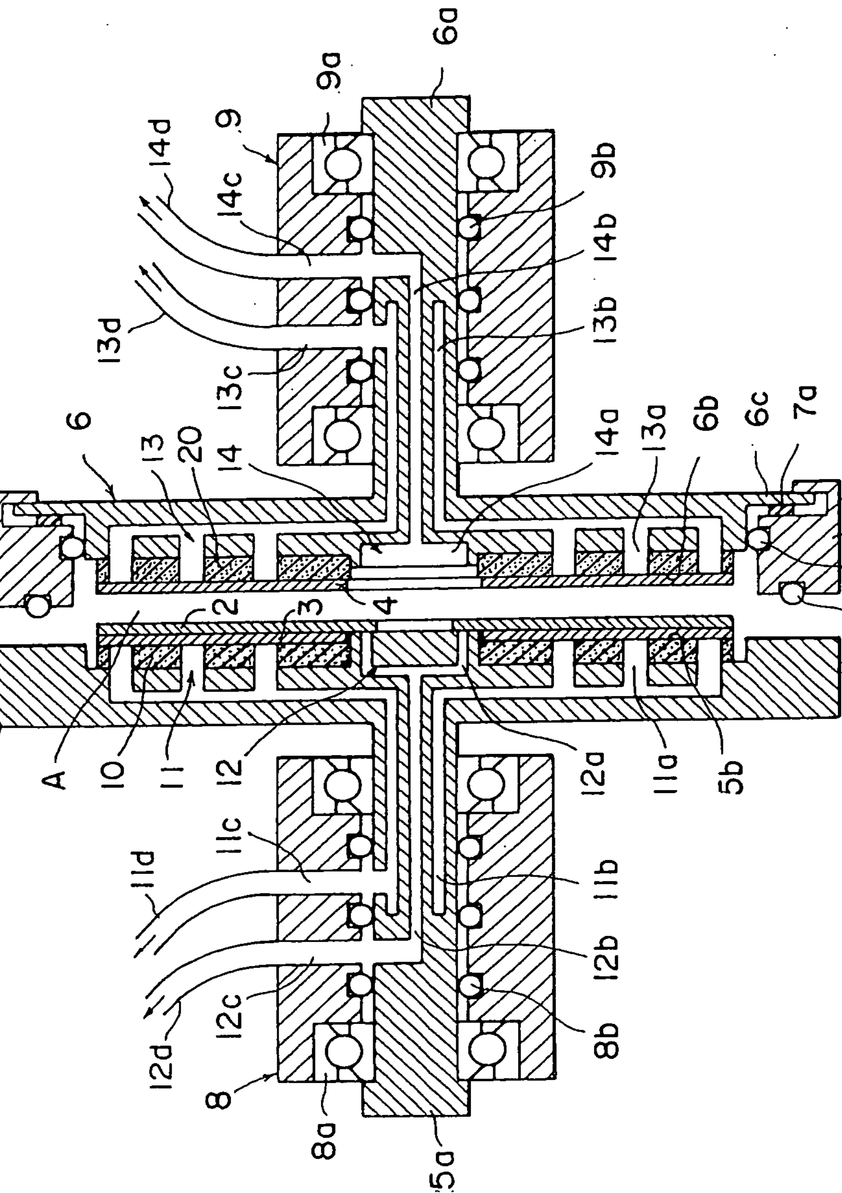
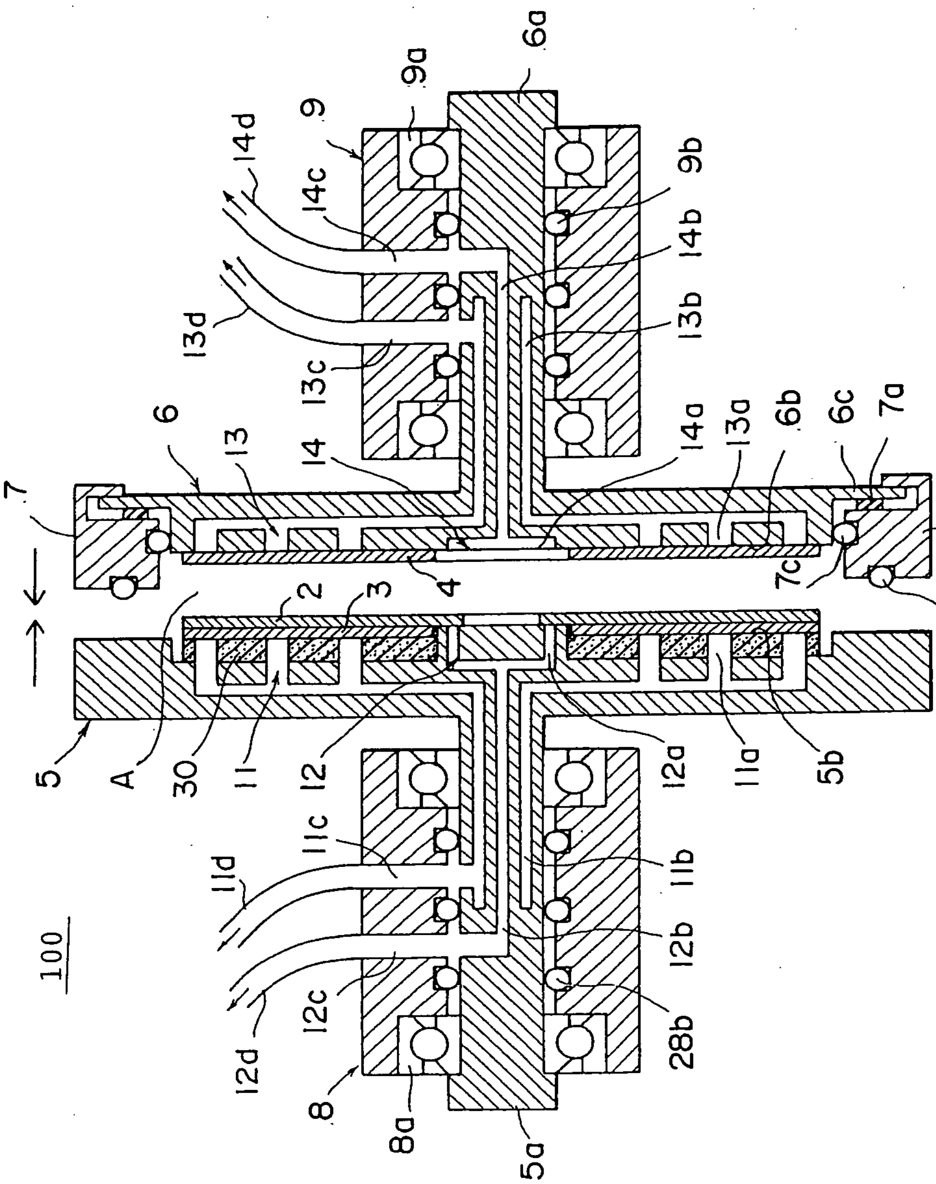

1
5
A
10
11
12
12a
11a
5b
5a
8
8a
8b
12d
12c
12b
11d
11c
11b
2
3
4
6
7
13
20
14
14a
13a
6b
6c
7a
7b
7c
9
9a
9b
6a
14b
14c
14d
13b
13c
13d

FIG.2



100
5
A
30
11
12
12a
11a
5b
2
3
4
7
7
7a
7b
7c
6
6a
6b
6c
9
9a
9b
13
13a
13b
13c
13d
14
14a
14b
14c
14d
11b
11c
11d
12b
12c
12d
28b
8
8a
5a

[Name of Document] Specification

[Abstract]

[Objective]

When double-sided simultaneous transfer is performed with both sides of the slave medium contacted intimately to master carriers, to prevent a removal failure by holding a slave medium after magnetic transfer by a holder portion arranged on a side to which the slave medium is supplied.

[Constitution]

The holder 1 for a magnetic transfer device comprises a first holder portion 5 and a second holder portion 6, which are movable toward and away from each other. Between the first and second holder portions, there is formed an interior space A where first and second master carriers 3, 4 with information are held in intimate contact with both sides of a slave medium, to which the information borne by the master carrier is transferred. The first holder portion 5 has a pressing surface 5b on which the first master carrier 3 and the slave medium 2 are held, and the second holder portion 6 has a pressing surface 6b against which the second master carrier 4 is pressed. When pressure is applied, the compressive

deformation quantity of the pressing surface 5b of the first holder portion 5 is greater than that of the pressing surface 6b of the second holder portion 6. Both sides of the pressing surfaces 5b, 6b are constructed of elastic members 10, 20 which are different in the elastic module or thickness, or the elastic member is provided with the first holder portion 5.

[Selected Figure] Figure 1